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(54) Title: INTERACTIVE COMMUNICATION NETWORK

(57) Abstract

The invention relates to a method of utilizing an interactive wireless communication network in a defined, logically divided area for a location–independent audience with portable communication units for audiovisual messages, in which the available information depends on what position the individual communication unit has within the area, and which may map the pattern of movement of the audience. Position–related electronic information from a base unit (1) with aerial equipment (2) to an audience unpredictably wandering about, is achieved through ordinary geometric measurements from at least two aerials. For information separation purposes the area is divided into a logical grid of fields/zones identified by coordinate references, in which hierarchic information and/or links to other sources of information has been assigned to each logical field. Each communication unit (3, 4, 5, 6, n) may communicate interactively with the base unit (1) by activating transmitted information links, and is permitted through a signal selector (7, 8, 9, 10, n) to choose another or further information. Information acquired from the base unit (1) may be used to map the moving pattern of the audience. The communication unit (3, 4, 5, 6, n) is provided with an alarm device, which is triggered, for example at closing time, if the unit is physically moved out of the relevant area or similar.

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INTERACTIVE COMMUNICATION NETWORK

The invention relates to a method of utilizing an interactive wireless communication network in a defined logically divided area of a localization-independent audience with portable communication units for audiovisual messages, in which the available information depends on the position of the individual communication unit within the area, and which may map the pattern of movement of the audience.

The object of the system is to continuously communicate topical visual updatable messages, e.g. for information or advertising purposes, to a major number of visitors moving unpredictably within a defined area as for example a gallery exhibition or a shopping mall.

The topical audiovisual messages to be communicated individually to each person, activate the message communicating base unit of the system, and therefore depend on where in the premises each individual is located.

On an information unit, communication unit, for instance attached to a shopping trolley, airport trolley and similar, the visitors will receive messages continuously on such natural spots of attention.

Such wireless electronic information units which may be operated interactively for choice of language and similar, are given to the visitors to be carried around by them, for example in a gallery.

Today, a wide variety of variants are used to communicate information and advertisement, in which an essential part of these messages are directed to prospective customers, but who are not in a buying situation.

Beside this general shopping pattern, a customer goes shopping when goods useful to him are also cheap, and then within certain quality thresholds, geographical boundaries and financial limits.

To a great extent, the flow of external purchase promoting messages reaches the customer, when physically he is **not** able to make a purchase or make use of a service, for instance at home on his sofa with today's paper, or in front of his TV.

The advertising effort in terms of the sum of money spent to influence consumers to buy **prior** to their entering into an active buying situation, thereby finding themselves unable to actually buy, and the sales affecting effort, in terms of money, made towards the customer **after** he has entered the shop in question exactly to do some shopping, is estimated to be approximately inversely proportional.

Purposeful information of current interest to a customer who has put himself into an active buying situation by turning up, able to pay, in for example a shopping mall, has been given low priority in advertising, but some variants are known, like placarding, customer newspapers, messages called over the loud speaker network, huge piles of uniform articles, establishing of bargain stands, implementation of article demonstrations.

In some larger and internationally visited galleries there is used equipment with taped recordings in different languages of choice, handed out to the visitors.

By moving through the gallery, following a predetermined route and at the appropriate speed, the visitor will have informative, audible messages communicated to them, concerning what is consecutively shown during the passage.

Also common, is guiding by staff informing through galleries and museums and similar, where visitors are grouped according to choice of language and are guided in groups through the premises in question, without the possibility of stopping or skipping some of the described and exhibited sights.

The flow of information at air terminals is continuous and comprehensive.

In addition to current information on arrivals and departures on rolling text mechanisms on huge boards and monitors, loudspeakers were earlier used, but these are disappearing, primarily because of the disturbing working environment thus arising.

From the patent literature are repeated:

US 5,295,064 in which the audiovisual display system of Malec and Moer is based on display of advertising messages downloaded in advance by means of positioned mechanical sensors, and, among other things, is not based on interactive use, real-time wireless communication of information and flexible localization of the communication units, and does not essentially distinguish itself from the present patent application which is not tied to any particular applications like shopping trolleys, shops and similar, either.

US 5,485,139 in which Tarnovsky's system of verbal announcing to a local audience based on infrared detection, with messages played back from the system, which does not in any way allow two-way communication with the audience, is a static system, in terms of localization, with permanent pre-recorded messages which are considered thereby to fall outside the present application.

WO 899/07374, in which the system of Suffern and Wilson for transmitting wireless information to receivers in limited areas, indirectly assumes that in principle there is only one receiver in the proximity of a transmitter. The system lacks possibilities of interactive use and differentiation between users; the base station transmits the same information repeatedly, and does not contain any other way either to differentiate the message than proximity to the transmitter. There is not any possibility of further identification or localization. In addition the message is based on static, pre-stored information, and moreover is based on reproduction of sound and not on combination of data, so that the present application distinguishes itself in several points.

Data communication

Two-way communication of data between transmitter and receiver is carried out by implementation of a communication protocol, maybe universal, which supports various forms of data transmission and data formats.

A data packet in this context would be a structured composition of digital data, e.g. pictures, words, numbers, sound, pointer information and program instructions.

Typical elements supported by the protocol are already known and tested techniques, such as

- the use of data compression based on recognized or licensed techniques/algorithms
- transmission and subsequent running of program instructions for example for reprogramming the receiver
- transmission of information on error correction and confirmation
- transfer of data packets with redundant information. Transferred pointer fields and/or earlier selections (menu) may decide what is to be used and displayed
- use of active pointer fields ("links") to other positions in the same data packet or a new data packet (which would imply a request for transfer of a new specific data packet) (typically the "hyper text mark-up language" principle)
- transmission of the same information to several receivers within the same location (grid area or circle)
- sequential rolling transmission of data to one or more receivers, in which e.g. accompanying pointer fields decide what is to be filtered out (typically broadcaster videography principle; one-to-many communication)

- temporary storing of transferred data to be used later
- transmission of data immediately prior to use or queries
- voice output of communicated words
- transfer of digital sound information which may be recovered to analogous sound
- transfer of common messages, such as general calls, closing hours etc. or a combination of the above.

This involves that it is conceivable for the data packet to be of varying priority, for instance by calls and evacuation messages not being screened off or closed.

Typical examples of the above may be

- transmission of multi-lingual data packets in which the individual receiver screens off information on the basis of choice of language,
- transmission of data packets of different contents, in which the individual receiver screens off information based on selected profile, according to cost awareness, fields of interest etc.
- transmission of sequential information during a perform ance, presentation etc.
- interactive use and interrogation
- booking of offers and services.

Wireless communication

Two-way wireless transmission between transmitter and receiver is based on common techniques for such transmission by the use of suitable and available frequencies, either as simultaneous one- or two-way communication.

By a transmitter is to be understood a stationary base unit and by a receiver, a mobile portable communication unit, in which both the transmitter and the receiver may perform both transmission and receiving of wireless signals.

A complete system may consist of a base unit with several mobile communication units. Used on a larger scale or in larger areas, it is conceivable for the system to be expanded by more base units, in which each base unit is assigned to a specific primary catchment area.

By the use of several base units, separation according to distance and thereby signal intensity, time schedule and/or frequency can be used for their separation. If a communication unit moves from the primary area of one base unit into another base area, the assigned frequency of communication of the communication unit for example may bye changed in accordance with the move to avoid interference. It is assumed that the positioning of adjacent base units that may interfere, may be coordinated.

Within the catchment area of a base unit, a communication unit may be moved freely.

For the communication unit to be activated, it may listen for transmitters/base units. On accepted signal quality a signal is transmitted for the establishment of orderly communication with the base unit.

A base unit responds with information about assigned communication frequency(-cies) and/or time slot(s); this will depend on the number of communication units and protocol desirable for use within the area of the base unit.

The use of time slots involves that each communication unit is assigned its regular repeatable period of time for the transfer of data, which period will be different from the time slots that have been assigned to other communication units or will be assigned to them. In the assigning of time slot is assumed that the units are synchronized.

This may be relevant for transmissions both from and to the base unit. What will be topical will depend on what communication protocol may be relevant to use, within each base unit.

Typical combinations are:
- a time slot for each grid area within the area of the base unit in one-to-many transmissions from base unit, i.e. current position of communication unit decides from which time slot it transmits information
- a time slot and, if a great number, maybe the frequency for each, independent on the localization in the grid area, i.e. typical of a one-to-many communication.

The amount transmitted from communication unit to base unit will normally be very modest compared to transmissions from the base unit, i.e. to many communication units. It is therefore conceivable to use fewer, maybe just one frequency with time slots for all communication units for transmissions from them to base unit.

Localization of the communication units may be solved by using two or more aerials connected to the base unit. It is assumed that the base unit and the individual communication unit are time synchronized.

However, a problem is that the synchronization will depend on how far away a communication unit is from the base unit when establishing communication. Transmission of synchronizing information will be delayed in itself because of the time it takes before this information reaches the communication unit.

This may be solved by introducing a fixed time delay in a communication unit's response to calls from the base unit.

The time delay calculated by the base unit is used in the next instance to supply the communication unit with how large the real time delay is, relative to where the communication unit is located at the moment of synchronization.

Synchronization may be repeated at regular intervals to "re-calibrate" the synchronization. Crystals in communication unit(s) and base unit(s) will sooner or later experience a deviation which will lead to the calculated localization, which depends on the time of transmission of frequency signals, deviating from the actual localization.

Return frequency may be used by the communication unit at regular intervals to switch between transmission of ordinary return data and transmission of a locating signal. In each period of time, during which the base unit expects to receive locating signals en route from a varying number of communication units, the aerials of the base unit will listen for those.

If the communication unit(s) and the base unit are synchronized, and because of that, follow the same time scale, the base unit will know when the individual unit did indeed transmit its localization signal.

By using the difference between the times when at least two differently located aerials receive the individual locating signals, the transmission time and thereby the distance between each aerial and the individual communication unit may be calculated.

Based on elementary trigonometry the position of the communication unit in relation to the aerials of the base unit may be calculated.

The calculated position in relation to the aerials of the base unit may then be transformed to the logical grid, which decides which information is to be sent to the individual communication unit.

Logical Grid

The area of coverage of a base unit is divided into one or more logical zones. These do not necessarily have to be square. It may be natural to let the existing configuration of the physical area to be covered by the base unit, form the basis of the division into zones.

The computer of the base unit is configured with information on the location of the aerials, division into logical zones and all the information wanted to be connected to the individual zones. Parts of this information may conceivably be acquired automatically from other sources (wind gauges, broadcaster videography, the Internet etc.) and connected to the information transmitted to the individual zones.

Given that the base unit has the communication units that might find themselves in the area of coverage, connected, and that it gets to localize them within the logical zones that they are in, the base unit may start to transmit desired information associated with the zones.

Information transmitted to the communication units will depend on what zone they are in, and which choices the users make on the basis of the information transmitted to them. However, this does not exclude parts of the information from being common to or available in several zones.

A method according to the invention, generating localization-dependent and individually directed, interactive wireless communication of audiovisual updatable messages to a major number of individuals, moving unpredictably, will receive individually within a defined area information by wireless transmission, which information may be changed interactively through e.g. language options.

Thus, if big galleries and museums exhibit their attractions to an audience consisting of a large number of individuals who, themselves, choose their routes through the gallery, according to what objects are of individual interest, taking into account each individual's time horizon for the visit, and in the individually selected language receive audiovisual information about the individual attraction, regardless of where the visitor is located at any time, the flow of audience will assume a considerably calmer character, without groups hurrying around and being called to by paid guiding staff.

Fig. 1 shows schematically an arrangement of the electronic devices involved. From the base unit (1), which is a message-storing and -providing computer, information is transmitted through aerial equipment (2) to the communication units (3, 4, 5, 6, 7, n) carried unpredictably by a large individual audience within a defined area.

With carried communication units (3, 4, 5, 6, n) the audience will form a random mobile net varying in time.

On each communication unit the individual (7, 8, 9, 10, n) may make simple changes/choices of the form of the message, for example by selecting language, today's offer, flights to Asia, or similar.

The base unit (1) may contain any mixture of words, pictures, graphics and sound, and be manually or automatically up-datable after input from e.g. a floppy disc, modem etc.

According to the invention, it must contain particular soft-ware which registers where the individual communication unit is located and moving.

The communication unit may be equipped with an alarm device which is triggered if it is physically moved out of the area which is assumed to be served.

Physically the communication unit is battery operated and, as needed, waterproof and shock-proof.

Communication unit(s) and base unit have been synchronized when communication was first accepted and agreed.

Return communication may consist of periods of both ordinary return data and signals used to locate portable communication units.

The time interval of each communication unit within a period of time is longer than the time it takes for the frequency signal to reach the aerial(s) of the base unit.

The localization of each communication unit is calculated on the basis of the time it takes for a transmitted localization signal to reach the aerial. Synchronization of communication unit(s) and base unit ensures that the base unit knows when each localization signal was transmitted.

Calculated coordinates are compared and transformed into a logical grid.

C l a i m s

1. A method of utilizing an interactive wireless communication network in a defined, logically divided area of a localization-independent audience with portable communication units for audiovisual messages, in which available information depends on what position the individual communication unit has within the area, and which may map the pattern of movement of the audience, c h a r a c t e r i z e d i n that within a defined area, e.g. a gallery, shopping mall, airport terminal and similar, which is divided into a predefined logical grid, there is established an individually programmable electronically supported wireless transmitter and receiver network based on transmitted position-related information from a base unit (1) with aerial equipment (2), for an audience wandering about, carrying communication units (3, 4, 5, 6, n) which are continuously carried to unpredictable locations within the area, with the possibility of continuously changing messages to each of the cells of the grid, based on the localization of the individual communication unit at any time, and in which the audience is allowed individually to change the kind and form of the message, e.g. by selecting language, by the signal selector (7, 8, 9, 10, n), and that the running generation of data may map the pattern of movement/ moving activity of the audience.

2. A method according to claim 1, c h a r a c t e r i z e d i n that said defined area is divided for information separating purposes into a logical network of fields/ zones identified by (1*, 2*, 3*, 4*, 5*, 6*, n*) and (X, Y, Z, n) in which each field/each zone is identified

by coordinate references, e.g. (Y5*), to which field a unique and localization-related message is communicated, and that messages are received by the communication unit (3, 4, 5, 6, n) located in one field, also if the communication unit is carried marginally into the adjacent field, like the area (1*') within the field (2') and vice versa, if the receiver is carried marginally into the adjacent field like the area (2*) within the field (1*), or also for information separation purposes by the individual coordinate fields being separated by transverse gaps (0).

3. A system for spreading location-dependent messages from a base unit (1) with aerial devices (2), the messages being received in programmable positions logically divided into zones, to a number of communication units (3, 4, 5, 6, n) which are unpredictably moved about by an audience, characterized in that the base unit (1) with the aerial equipment (2) is provided with software allowing automatic, interactive, wireless communication with electronic mobile communication units (3, 4, 5, 6, n) based on manual configuration and/or automatically configured connection to other informative systems, like TV, the Internet, or media, like a hard disk, CD-ROM and similar; that the assigning of frequencies and time slots for the establishment of individual two-way communication is done automatically by the base unit (1) on the connecting of communication units (3, 4, 5, 6, n) to the base unit (1) or on the transfer of one communication unit from one base unit to another in a manner corresponding to the technique of existing mobile communication networks; that the base unit (1) with aerial equipment (2) may locate each individual communi-

cation unit (3, 4, 5, 6, n) by using two or more differently localized aerials associated with the base unit, to measure the distance to a communication unit and use ordinary geometry to decide which logical field/zone the communication unit is in; that structural, hierarchic information and/or links to other sources of information are assigned to each logical field, and that this may be done automatically or on request from a communication unit available for communication, based on its presence within the pertaining logical field/zone; that mobile electronic communication units (3, 4, 5, 6, n) may communicate interactively with the base unit (1) by activating transmitted information links, and are given options through signal selectors (7, 8, 9, 10, n) on the communication unit, indirectly leading to queries to the base unit (1) for further information or other information; and that the information acquired from the base unit (1) on the use and movement of the individual communication unit may be used to map the preferences/ pattern of movement of the audience.

4. A system according to claim 3, c h a r a c t e r i z e d i n that the individual communication unit (3, 4, 5, 6, n) is equipped with an alarm device, which is triggered at closing time or if the unit is physically moved out of the area assumed to be known.

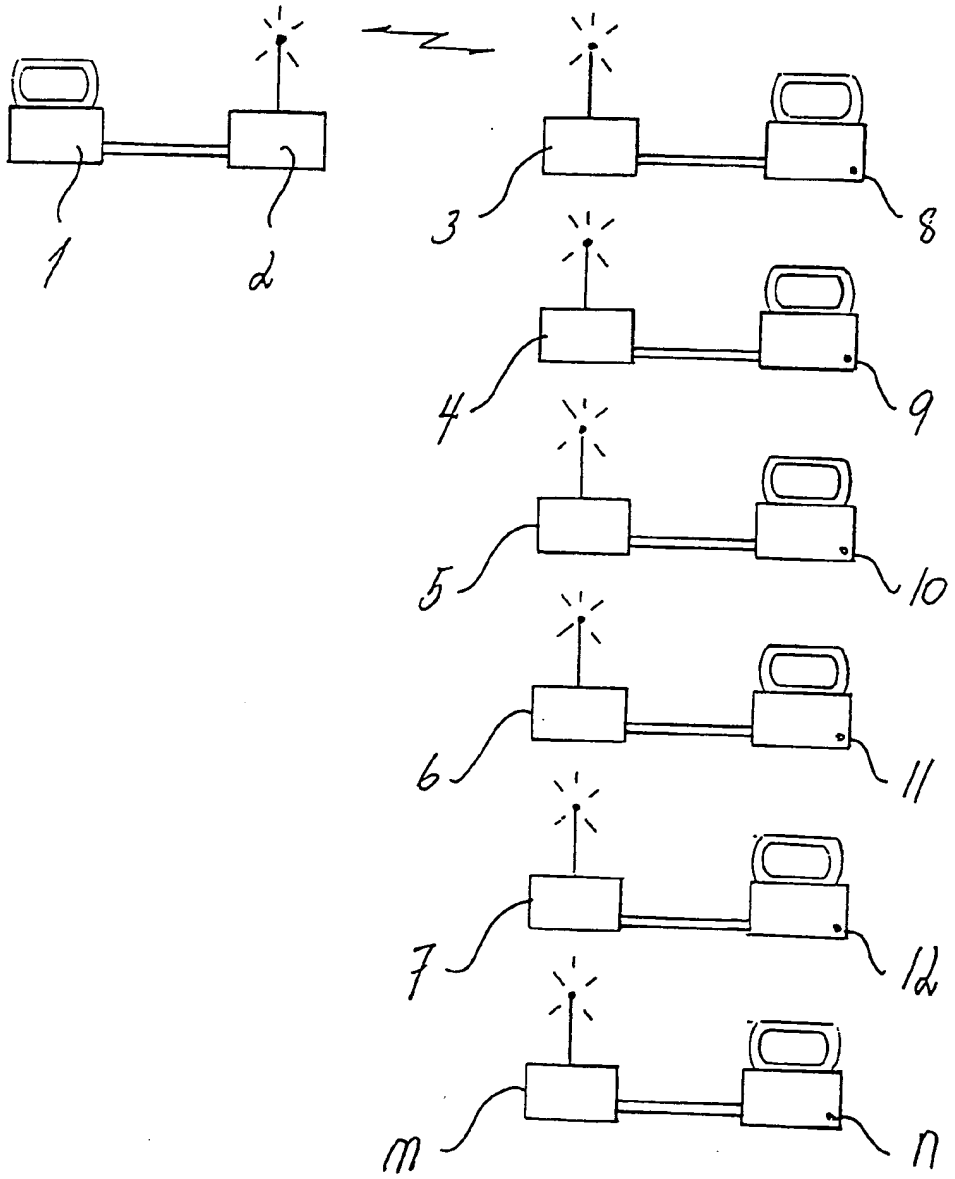


FIG. 1

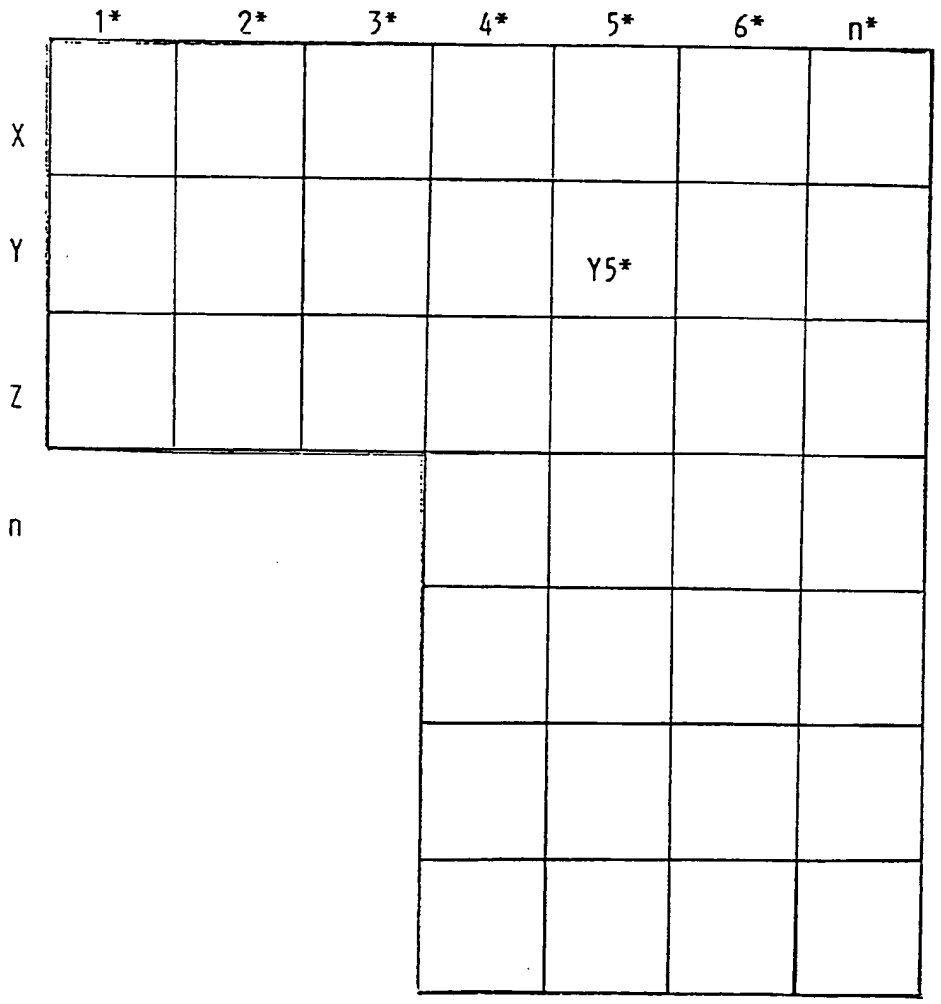
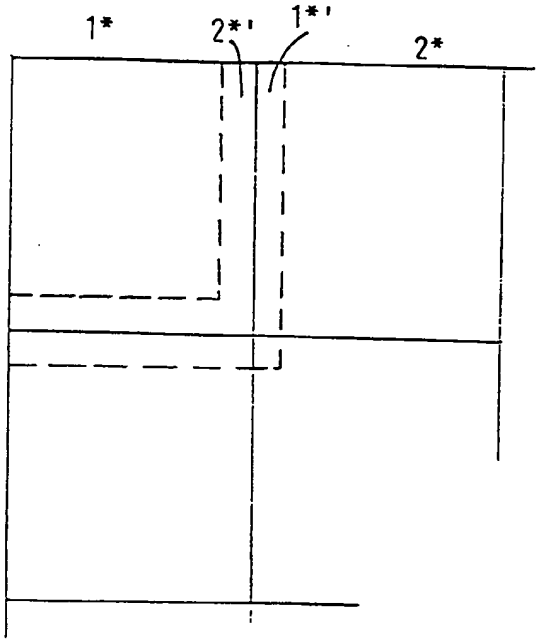


FIG. 2



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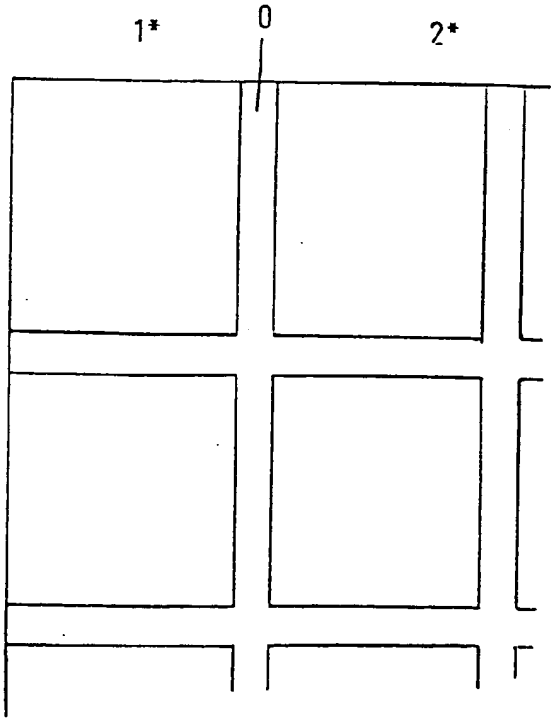

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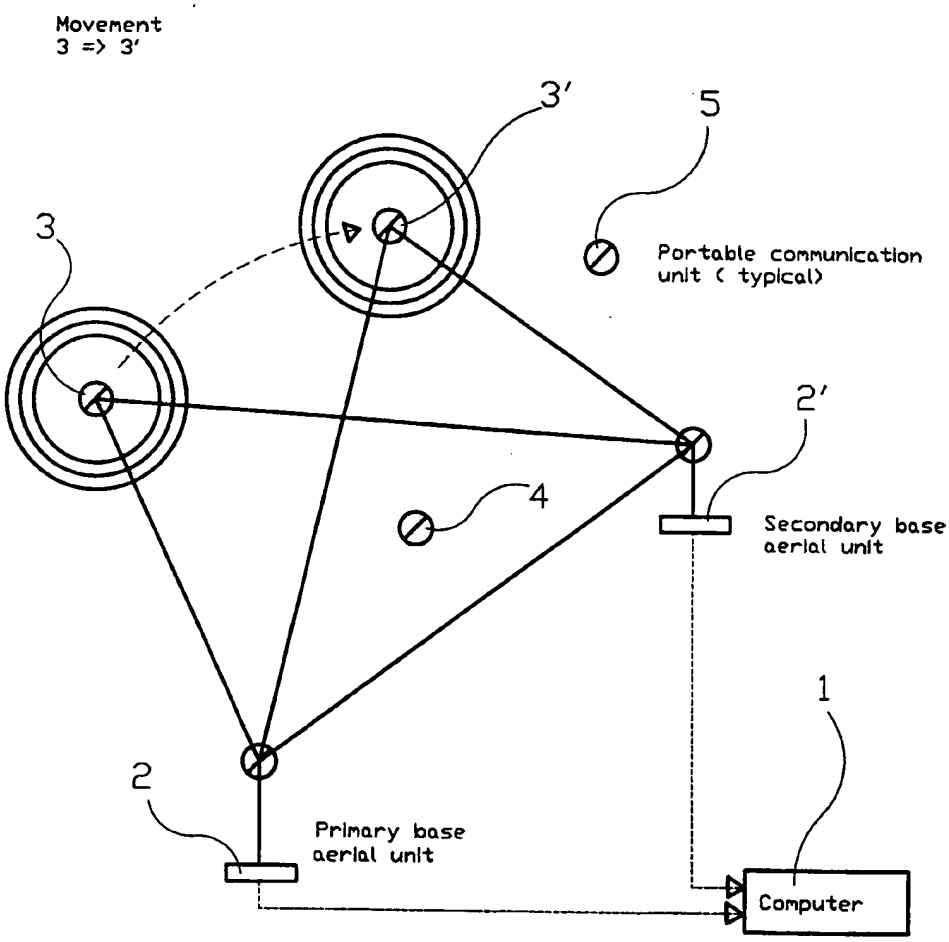
FIG. 3


Movement
3 => 3'
3'
5
3
Portable communication
unit (typical)
2'
4
Secondary base
aerial unit
1
2
Primary base
aerial unit
Computer